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EFFECT OF b-ENDORPHIN$_{1-27}$ AND AN ANALOGUE OF b-ENDORPHIN$_{28-31}$ ON THE CONTRACTILE RESPONSES OF MOUSE SKELETAL MUSCLE. S. Khan, M.E. Smith. Department of Physiology, Medical School, University of Birmingham, Birmingham B15 2TT.

In previous work in this laboratory specific binding sites for [^{125}]β-endorphin (β-EP) and [^{3}H]naloxone were demonstrated on the surface membranes of skeletal muscles of the mouse, (Hughes and Smith, 1990). In recent work β-EP was shown to cause an increase in the contractions developed in mouse skeletal muscle in response to stimulation of the motor nerve but it had no effect on the responses to direct stimulation. The action of β-EP was inhibited in the presence of naloxone indicating that the effect was opioid in nature. Agonists for δ-opioid receptors produced the same effect, (Khan and Smith, 1995). In the present work we have shown using an isolated phrenic nerve hemi-diaphragm preparation of the mouse that both β-EP 1-27 and MPF (a stable analogue of β-EP 28-31) increased the isometric tension developed in the diaphragm muscle. The effect of MPF was more sustained than that of β-EP or β-EP 1-27. Furthermore naloxone inhibited the action of β-EP 1-27 but had no effect on the action of MPF. These findings are consistent with β-EP acting at both an opioid and a non-opioid site on the skeletal muscle membrane and they indicate the presence of a novel β-endorphin receptor in this tissue.

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THE EFFECT OF b-ENDORPHIN AND a-MELANOTROPIN IN MUSCLE WASTING IN MICE. M.E. Smith, S. Hughes. Department of Physiology, University of Birmingham, Birmingham UK.

The expression of the pro-opiomelanocortin-derived peptides β-endorphin and α-MSH, is increased in motoneurones of mice with muscular dystrophy (1). Furthermore the density of the peptide receptors is increased on their skeletal muscles (2). The peptides or their derivatives have been shown to increase muscle strength (3,4), and to promote synaptogenesis at the neuromuscular junction (5). Muscular dystrophy is characterised by high blood levels of creatine phosphokinase (CPK) which leaks out of muscles. In this study we investigated whether administration of the peptides to normal and dystrophic mice would affect the levels of the enzyme in the blood.

β-Endorphin (β-EP) and α-melanotropin (α-MSH) were administered to normal and dystrophic C57BL6J mice over 5 weeks. All groups of normal and dystrophic mice which had been treated with the two peptides gained significant body weight, as did the normal and dystrophic saline-treated male controls, but the normal and dystrophic female controls did not. The plasma CPK was lower in normal mice and dystrophic males which had been treated with the peptides compared to the saline-treated controls. The activity of CPK was significantly higher in the extensor digitorum longus (EDL) muscles, but not the soleus muscles, of the peptide-treated dystrophic mice compared to the corresponding controls. Administration of α-MSH alone or β-EP alone had no significant effect on body weight or plasma CPK activity in dystrophic mice, although the activity of CPK was significantly higher in the EDL muscles of α-MSH-treated mice than in saline-treated controls. It is possible that β-EP and α-MSH act synergistically on the neuromuscular system to protect the muscles from damage.

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